REMARKS

Claims 1-67, including independent Claims 1, 11, 12, 18, 21, 24, 28, 42, 43, 49, 52 and 60, are pending. The amendments proposed above add no new matter, do not change the number or dependency of any claim, and are all clarity enhancements complying with requirements of form made by the Examiner.

Summary

The Examiner acknowledges that the Applicants' previous response overcame substantially all of the grounds for rejection set forth in the first Office Action. As such, the finality of the rejections in the current Office Action would be appropriate, except that all of the prior art rejections in the current Office Action are unsupported by the cited prior art. None of the pending claims are anticipated or rendered obvious by the cited prior art, as asserted by the Examiner. Because the grounds for rejections set forth in the current Office Action will not be sustained in an appeal to the Board of Patent Appeals and Interferences, the Examiner is respectfully requested to reconsider this application and withdraw all of the prior art rejections.

The proposed amendments set forth above are matters of form that address clarity issues raised by the Examiner, and may be properly entered pursuant to Rule 116(b) as complying with requirements of form set forth in a previous Office Action. Alternatively, the proposed amendments place the application into better condition for appeal. Barring new grounds for rejection over the prior art, the proposed amendments will place the application into condition for immediate allowance. The Examiner is respectfully requested to grant such allowance, rather than require the Applicants to file a request for continued prosecution (RCE) merely to correct minor clarity issues that are resolved by the proposed amendment.

A note in regard to improper attribution of subject matter to references devoid of such subject matter is set forth immediately below, followed by remarks traversing all prior art rejections. Thereafter, remarks addressing each grounds for rejection or objection in respect of claim clarity are set forth.

Attributing Specific Teaching Based on an Absence of Information in a Cited Reference

Before turning to specific limitations, it will be useful to clarify the nature of an error that the Examiner has made repeatedly. When asserting that a particular reference teaches a limitation recited by a particular claim, the Examiner in several crucial instances has attributed teaching to a reference based upon an absence of information in such reference. In other words, the Examiner has loosely interpreted a reference and "filled in the blank" with subject matter that the Examiner wishes the reference to teach. It is respectfully submitted that this interpretation is impermissible.

An Examiner may attribute a limitation to a reference even though it is not explicitly disclosed in such reference if the missing descriptive matter (the "gap" in the teaching) is "inherent" in the reference. However, the circumstances that can justify a finding of inherency are quite narrow. The MPEP states, "[S]uch gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill" (MPEP 2131.01 part III, citing *Continental Can v. Monsanto*).

It can also be proper for an Examiner to rely upon common knowledge, such as by taking "official notice" of such common knowledge, but only in a narrow range of circumstances. MPEP § 2144.03 provides the following guidance in this regard. The fourth paragraph in this section begins (emphasis provided in the MPEP): "It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known." The fifth paragraph begins "It is never appropriate to rely solely on "common knowledge" in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based." (With citations to *Zurko*).

Several instances in which the Examiner has attributed specific teaching to a reference are set forth below, within discussions of particular references to which such (absent) teaching is attributed. In none of these instances does the Examiner provide any evidence to support his assertion, but rather simply provides a conclusory statement that the missing subject matter is "deemed" to be present, or "can be considered" to be present. The impropriety of such conclusory statements is also clearly indicated in MPEP § 2144.03, for example in the quotations from *In re Lee* (Fed. Cir. 2002) in the fifth paragraph.

On page 23 of the current Office Action, the last full sentence asserts that Hara teaches certain subject matter, specifically stating: "If the signal path coupled between clock output OUT and the plurality of transfer capacitor coupling switches is deemed circuitry, the coupling circuitry couples the signal to each switch without increasing the rate of voltage rise or fall, rendering claims 3 and 4 obvious." While the Examiner's statement is not entirely comprehensible, it is respectfully submitted that Hara provides no teaching whatsoever as to how the clock should be coupled to the transfer capacitor coupling switches. Rather, Hara shows only an arrow pointing from an oscillator block to a charge pump block. Even less does Hara teach that such coupling avoids increasing the rate of voltage rise or fall of the clock signal. Thus, this is an egregious example of attributing subject matter to a reference that is devoid of such subject matter.

Other examples in which the Examiner improperly supports a rejection by attributing subject matter to a reference, despite an absence of such subject matter in the reference, are set forth below with regard to particular limitations and prior art references.

Rejections Over the Prior Art

The Examiner rejects each of the independent Claims 1, 12, 18, 24, 26, 28, 43 and 49 as unpatentable over Tasdighi in view of Yamauchi, and/or as unpatentable over Tasdighi in view of Hara. To support a traversal of these various grounds for rejection, the remarks set forth below demonstrate that all of these references, taken together, fail to teach, disclose or fairly suggest at least one significant limitation in each of the listed independent claims. Demonstration that all three references fail to teach at least one limitation in each independent claim precludes any subcombination of such references from supporting even a *prima facie* case of obviousness for any of such rejected claims. This circumstance, in turn, requires a conclusion that each of the independent Claims 1, 12, 18, 24, 26, 28, 43 and 49, as well as each claim properly depending from any one of these claims, is nonobvious over any combination of Tasdighi, Yamauchi and/or Hara. Ito is a separate case, and therefore, it is discussed separately.

Please note that even though the cited prior art references are each discussed separately hereinbelow, all possible combinations of the cited prior art are thoroughly and fairly addressed. Indeed, the combinations that are addressed even exceed those applied by the Examiner. As demonstrated below, all of Yamauchi, Hara and Tasdighi fail to teach at least one significant limitation in each independent claim, precluding any combination of these references from rendering any independent claim obvious. It is also demonstrated that the skilled person would not combine any teaching in Ito that is inconsistent with charge pump prior art with any of the cited prior art charge pump references. Consequently, a combination of Ito with any of the other references is immediately nonobvious.

All combinations of the cited references are thus thoroughly considered in the present Response. As such, the Examiner's argument that the Applicants attempt to attack references individually (which is set forth on page 32 of the current Office Action) is certainly not warranted with respect to the present Response. The Applicants' respectfully submit that the argument was also unwarranted in respect of the Applicants' previous Response dated April 1, 2005.

Selected Limitations of Claims Rejected Over Prior Art

A group of limitations, including at least one from each of the listed independent claims, is set forth below, and each limitation is designated with a shorthand reference. Thereafter, Yamauchi, Hara and Tasdighi are discussed in turn to demonstrate the absence of all of the designated limitations from each of these references. The failure of all combined references to disclose even a single significant limitation in a claim is sufficient to render such claim nonobvious. As such, for brevity a minimal number of limitations is discussed. Other arguments for allowability are not waived. Rather, all such other arguments are reserved to be presented later as may be useful.

Claim **1** recites in part "a ring oscillator comprising an odd number of not more than three inverting driver sections." Claim **43** recites a similar limitation. Each such limitation is referred to by the simplified designation "a three-section charge pump ring oscillator limitation."

Claim **12** requires in part: "a voltage waveform of the charge pump clock output to be substantially sine-like." Claim **28** includes a similar limitation. These are designated as "a substantially sine-like limitation."

Claim **18** requires in part (emphasis added):

> ... d) a charge pump clock generating circuit configured to provide a single-phase charge pump clock output coupled passively, without conveying substantial transfer current, to control nodes of each of the source switching devices to cause conduction during charge periods and nonconduction during discharge periods for all of the source switching devices, the charge pump clock output further coupled passively, without conveying substantial transfer current, to control nodes of each of the output switching devices to cause nonconduction ... .

Similar limitations are also set forth in Claim **49**. Moreover, Claim **24** recites in part: "d) a capacitive coupling circuit coupling a charge pump clock output to one of the control nodes corresponding to a source switching device or to an output switching device." Because this limitation of Claim 24 is an example of passive coupling, and because the cited references lack any teaching whatsoever in respect of passive coupling, Claim 24 is lumped together with Claims 18 and 49, and all such limitations are encompassed by the general designation of "passive coupling limitation" in the remarks set forth below.

Yamauchi

On page 14 of the current Office Action, the Examiner rejects Claims 1-4, 10, 12, 14, 16, 43-44, 48-51, 53 and 57-58 as obvious over Tasdighi in view of Yamauchi.

The three-section charge pump ring oscillator limitation of Claims 1 and 43: Acknowledging that the subject matter is absent from Tasdighi, the Examiner particularly relies upon Yamauchi for teaching of the three-section charge pump ring oscillator limitation. On page 15 of the current Office Action, the Examiner asserts that Figs. 6 and 7 of Yamauchi both show that a ring oscillator for a charge pump should consist of not more than three inverting driver sections. With all due respect, the Examiner's interpretation of Figs. 6 and 7 of Yamauchi is mistaken, and the assertion is consequently unsupported. Figs. 6 and 7 do NOT suggest that a ring oscillator for a charge pump should consist of only three driver sections. To the contrary, these figures teach using more than three driver sections.

It is true that Figs. 6 and 7 of Yamauchi includes physical drawings representing only three driver sections, which might seem to support the Examiner's contention. However, the second and third represented sections are separated by "..." at each connection point, which indicates that the illustration is abbreviated by omitting additional sections that are actually included in the design. Such abbreviation is purely a matter of reducing clutter in the drawings.

Nothing in the description of Figs. 6 and 7, which begins at col. 10, line 22 of Yamauchi, suggests anything contrary to the clear implication, in the drawings, that additional sections are employed, but not shown. The number of inverter sections is described only as an odd number of inverters connected in series, with the output of the last stage connected to the input of the first stage. It is improper to assert that a general value, such as "an odd number," somehow teaches a narrower range, such as "not more than three" (*i.e.*, the genus does not render obvious the species).

Yamauchi thus is merely cumulative of other cited prior art insofar as teachings with respect to the number of sections in a ring oscillator. This is to be expected, because Yamauchi is not interested in the number of stages of a charge pump's ring oscillator, but rather focuses on features that cause the ring oscillator frequency to change inversely with power supply voltage. Indeed, the focus of Yamauchi is concisely indicated by its title: "Internal Voltage Generation Circuit having Ring Oscillator Whose Frequency Changes Inversely With Power Supply Voltage."

The substantially sine-like limitation of Claims 12 and 28: On page 17 of the current Office Action, the Examiner asserts: "The periodic switching of 43 and 45 will effectively provide a CLK waveform that can be considered substantially sine-like." With all due respect, Yamauchi provides no support whatsoever for this assertion. Yamauchi in fact teaches nothing regarding charge pump clock waveform, which have most often been rectangular in nature. This is one of the instances in which the Examiner improperly attributes disclosure of a specific limitation to a reference despite absence of such subject matter in the reference.

The passive coupling limitation of Claims 18, 24 and 49: Yamauchi teaches nothing whatsoever regarding coupling the oscillator or clock to the charge pump circuit, aside from the bare fact that it is done. The Examiner does not point with particularity to any portion of Yamauchi as teaching this limitation. Rather, the Examiner relies (albeit incorrectly) on specific information in Tasdighi, and possibly in Hara, as disclosing this limitation.

Thus, Yamauchi fails to teach any of the three designated limitations.

Hara

On page 22 of the current Office Action, the Examiner rejects Claims 1-9, 12, 16, 18, 20, 22, 24-41, 43-51, 53-61 and 66-67 as unpatentable over Tasdighi in view of Hara. This grounds for rejection is a variation of a grounds set forth in the first Office Action (issued December 1, 2004) with respect to the subject application. To avoid excessive length in the present Response, the Examiner is referred to relevant remarks that were set forth in the Applicants' previous Response dated April 1, 2005, in particular the subsection entitled "*Oscillators Previously Thought Unsuitable Unexpectedly Solve Problem*" that begins on page 21 of the previous Response.

The three-section charge pump ring oscillator limitation of Claims 1 and 43: The Examiner correctly suggests that one might use some of the ring oscillators of Hara in a circuit as taught by Tasdighi. However, Hara does not show or describe three-stage ring oscillators for use with charge pumps. The Examiner glosses over this fact by stating (underlining added for emphasis): "Using a <u>modified</u> ring oscillator with only three driver sections . . . renders claim 1 obvious." However, this is another instance in which the Examiner attributes teaching to a reference that does not include such subject matter. Such attribution is improper, as is noted in detail in the foregoing section subtitled "*Attributing Specific Teaching Based on an Absence of Information in a Cited Reference.*"

The Examiner attempts to support his assertion of the obviousness of modifying Hara ring oscillators to three stages by listing possible motivations for such a modification. He states: "A ring oscillator with three driver sections will still provide a charge pump clock output, and will use few elements, require less area, and consume less current, than a ring oscillator with a higher, odd number of driver section." However, because the Examiner has not cited teaching in a reference as evidence that a skilled person would consider using three section ring oscillators with a charge pump, the motivating reasons alone certainly cannot render such a limitation obvious. Instead, these motivating reasons support a contrary contention that the limitation is nonobvious: if there are so many reasons to employ three stages, why has the Examiner found no art describing such a design from among the multitude of references in the crowded field of charge pumps? Applicants respectfully submit that the Examiner has found no such art because it is nonobvious to employ three-stage ring oscillators for use with charge pumps.

The substantially sine-like limitation of Claims 12 and 28: In this regard, the Examiner asserts (beginning on the last line of page 24 of the current Office Action, underlining added for emphasis) that: "[C]lock output OUT can be considered substantially sine-like (e.g. alternating between high and low type levels) ... ." However, Hara makes absolutely no suggestion that the clock output could be considered in any way sine-like. The usual interpretation of a "clock" would be a rectangular wave. Thus, this is another instance in which the Examiner improperly attributes disclosure of particular subject matter to a reference that is entirely silent as to such subject matter.

There is another way of viewing the Examiner's supporting statement, though it is no more valid. The Examiner has rejected the "substantially sine-like" limitation as indefinite, and thus may be suggesting that it has no meaning beyond "alternating between high and low type levels." Such an interpretation of "substantially sine-like" is contrary to the manner in which even a novice in the art would interpret the phrase. The Examiner's attention is respectfully directed to MPEP § 2143.03, which specifically states "A claim limitation which is considered indefinite cannot be disregarded." Any skilled person would immediately understand that if a waveform is required to be "substantially sine-like," then distinctly un-sine-like waveforms (such as rectangular pulses) are not covered.

The passive coupling limitation of Claims 18, 24 and 49: The Examiner apparently has not indicated any specific support in Hara for the passive coupling limitation. On page 24 of the current Office Action, the Examiner acknowledges that neither Hara nor Tasdighi shows capacitive coupling circuits to at least one transfer capacitor coupling switch. Nonetheless, the Examiner goes on to state "Fig. 20 of Hara shows

capacitive coupling circuits (not labeled) connected to transistors 12p and 12n, which one of ordinary skill in the art would understand are types of coupling switches." This statement is simply incorrect. Transistors 12p and 12n are in fact unswitched current limiting devices that limit the current available to drivers in a ring oscillator. In the first place, the signal source coupled by these capacitors is not a clock or oscillator as required, but rather is an analog level control signal. Moreover, the target to which the signal is coupled is not a coupling switch, as required, but is an unswitched current limiting transistor within a ring oscillator circuit.

The foregoing appears to be the only effort by the Examiner to indicate with particularity where Hara teaches passive coupling subject matter. On page 26 of the current Office Action, the Examiner refers back, apparently to this inaccurate assertion, stating: "As previously described, first charge pump clock output OUT can be coupled to each TCS circuit by a corresponding capacitive coupling circuit." No clear antecedent basis for this statement is found in the current Office Action. In any event, it is respectfully submitted that Hara includes no such teaching.

Thus, Hara fails to teach any of the designated limitations.

Tasdighi

Beginning on page 12 of the current Office Action, the Examiner rejects Claim 18 as anticipated by Tasdighi. Furthermore, the Examiner asserts Tasdighi as the primary reference in the rejections over Yamauchi and Hara noted above.

The three-section charge pump ring oscillator limitation of Claims 1 and 43: On page 15, lines 15-16 of the current Office Action, the Examiner acknowledges that Tasdighi does not disclose this limitation.

The substantially sine-like limitation of Claims 12 and 28: The Examiner does not specifically cite Tasdighi for this limitation. Moreover, the Examiner seems to acknowledge that Tasdighi fails to disclose this limitation in lines 8-11 on page 20 of the current Office Action. In any event, Tasdighi makes no suggestion that might reasonably be construed as teaching a limitation such as this. Indeed, Tasdighi explicitly states that the oscillator produces a "train of pulses" (col. 3 lines 15-17). A skilled person would consider a "train of pulses" to describe a rectangular waveshape, and would certainly not interpret the description as in any way suggestive of a "substantially sine-like" waveform.

The passive coupling limitation of Claims 18, 24 and 49: As in the first Office Action, in the current Office Action the Examiner again attributes the passive coupling limitation to Tasdighi. It is respectfully submitted that Tasdighi quite fails to teach this limitation. The Examiner bases the assertion that Tasdighi

teaches this limitation upon an absence of such subject matter. Thus, this is yet another, and particularly egregious, instance in which the Examiner improperly attributes a limitation based on an absence of information. Details demonstrating the baselessness of the Examiner's assertion that Tasdighi teaches this limitation are set forth below.

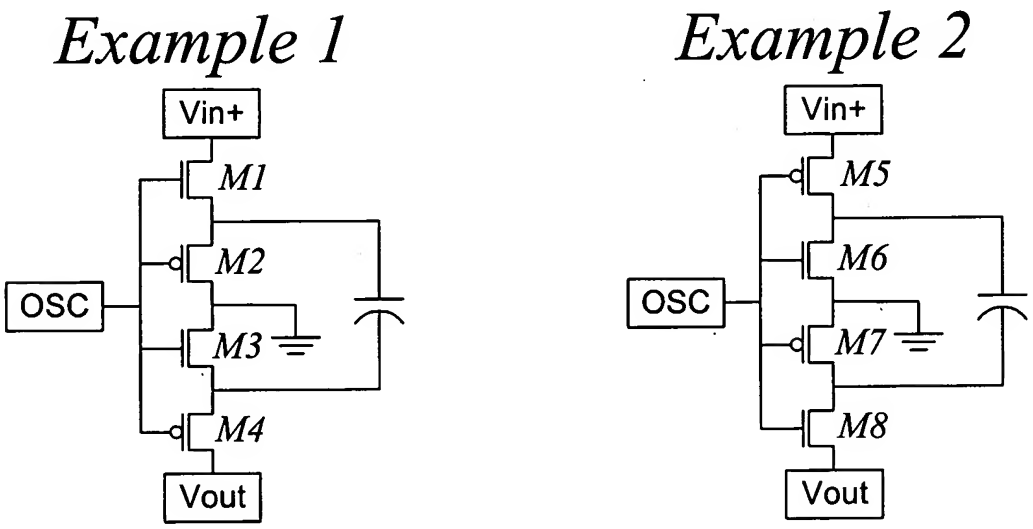
The Examiner asserts that Tasdighi teaches this limitation in the following statement, which bridges pages 13-14 of the current Office Action (emphasis added): "Since the charge pump clock output of oscillator 24 is not shown with any intervening elements between it and the control nodes of each switch SW1, SW2 (i.e. switching devices 26 and 27), the single-phase charge pump clock output is considered as being coupled passively to the control nodes of the switching devices." As noted in detail in the foregoing section subtitled "*Attributing Specific Teaching Based on an Absence of Information in a Cited Reference*," it is improper to base a rejection on such a conclusory assertion, which entirely lacks evidentiary support.

To help lay to rest this improper assertion of the Examiner, which is substantially repeated from the first Office Action despite the Applicants' previous remarks traversing this grounds for rejection, further remarks are set forth below to illustrate why a skilled person would not attribute this limitation to Tasdighi. The passive coupling asserted by the Examiner would render the circuit unsatisfactory for the purposes of Tasdighi; this assertion is supported by further remarks below. A modification that renders Tasdighi unsatisfactory for its intended purpose is nonobvious. MPEP § 2143.01 guides the Examiner in this regard, particularly in the subsection entitled "THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE."

On page 18 of the current Office Action, the Examiner asserts (underlining added for emphasis): "Since single phase charge pump clock output CLK is passively coupled (e.g. coupled by a straight line with no intervening elements) to the control nodes of the charging/discharging switches (e.g., see Tasdighi's transistors 26,27 shown in Fig. 3, with respect to SW1,SW2 shown in Fig. 2) ... " The straight line is merely an arrow indicating that the output is somehow coupled. Clearly, it does not connect the oscillator in Fig. 2 to devices in Fig. 3, and does not provide any support for the Examiner's assertion.

As noted above, the Examiner asserts that CMOS inverters according to FIG. 3 would be used for the switches SW_1 and SW_2 of FIG 2, and (to conform to the requirements of Claim 18) the oscillator of FIG. 2 would be coupled to all of the control nodes of the switches by means of a direct connection. Because V_A and V_B are not identified as to polarity, this must practically be accomplished as shown in either Example 1 or Example 2 below. "Example 1" is based on the assumption that V_A (in FIG. 3) is positive with respect to V_B,

while "Example 2" is based on the opposite presumption. These figures illustrate the coupling of the clock to the charge pump that the Examiner asserts is taught by Tasdighi. For simplicity, LOAD 22 and C2 are not shown.



During charge periods, FETs M1 and M3 of Example 1 (M5 and M7 of Example 2) are on; during discharge periods, those FETs are off and FETs M2 and M4 (M6 and M8 in Example 2) are on. In Example 1, a serious problem arises because the control voltage provided by OSC must traverse all the way from a voltage sufficiently high to turn on M1, down to a voltage sufficiently low to turn on M4. During such transition, M2 will be turned on concurrently with M3, resulting in a very low impedance (practically, a short) across the transfer capacitor, which will cause excessive noise and wasted power. This is entirely unsuitable for charge pump operation, and would be avoided in any practical design. One typical solution includes level-shifting circuitry that provides one signal to M1 and M2, and a separate signal to M3 and M4.

Turning to Example 2, the oscillator voltage must traverse from a value that is low enough to ensure that M7 is on, to a value high enough to ensure that M6 is on. During the transition from one to the other, M5 and M8 will conduct concurrently, substantially shorting the input voltage to the output voltage. As with Example 1, and for similar reasons, this circumstance is unsuitable for practical designs and would be avoided by a skilled person. Active circuitry (such as level shifting) is typically provided to avoid this serious problem. The problems caused by such undesirable simultaneous conduction by M5 and M8 are exacerbated by the fact that the voltages for which this circuitry is intended (RS-232 voltages) are typically +/- 12V, entailing substantial time for voltage transitions, and causing significant power consumption.

Thus, far from disclosing the designated passive coupling as asserted by the Examiner, the skilled person would certainly not couple the circuit in the manner asserted by the Examiner. As such, Tasdighi clearly does not teach any of the three designated limitations. Consequently, Tasdighi entirely fails to anticipate Claim 18, which includes a limitation to such passive coupling.

The foregoing remarks demonstrate that Tasdighi fails to disclose or teach any of the designated limitations.

Ito

On page 27 of the current Office Action, the Examiner rejects Claims 1-10, 12-20, 22-25, 27-41, 43-51, 53-61 and 66-67 as obvious over Tasdighi in view of Ito.

Ito differs from the other references cited by the Examiner in that the subject matter does not address charge pumps at all, but rather is directed to oscillators for use in VCOs and PLLs. As such, Ito is not relevant to indicate the sort of oscillators that would be appropriate for use with a charge pump. Oscillators are used for an extremely wide variety of purposes, notably the PLL purposes that are the focus of Ito. The Applicants do not claim to have invented an oscillator, but rather to have invented a charge pump that is extremely quiet. Some embodiments of the Applicants' claimed charge pump differ from prior art charge pumps by the characteristics of the oscillator employed. Many oscillators, though known, are not known for use with charge pumps.

Stated differently, no motivation is seen in Tasdighi or Ito to combine a random oscillator (which is designed for other purposes and has not been previously taught for use with charge pumps) with a charge pump. Instead, the skilled person would select an oscillator such as has been used with prior art charge pumps. The oscillators that are taught for use with charge pumps, in that crowded field, reflect the wisdom of a wide range of persons that are skilled, and even expert, in the field of charge pumps.

Tasdighi does not suggest the use of unexpected oscillators in a charge pump. To the contrary, Tasdighi explicitly teaches that oscillators may be "conventional," and that "[o]ne skilled in the art would understand the numerous varieties of oscillators which may be used in this invention." By these statements, Tasdighi clearly disavows any intention to extend the art of charge pumps by employing oscillators that are not conventionally employed with charge pumps. The "invention" in Tasdighi is a charge pump, and Tasdighi includes practically no teaching in regard to oscillators, aside from these appeals to convention. As such, the phrase "one skilled in the art" must be interpreted as "one skilled in the charge pump arts." Moreover, the

phrase "which may be used in this invention" clearly and exclusively limits the oscillators to those known to be useable with charge pumps.

Ito is not reasonably analogous art to charge pumps. As such, the skilled person would not turn to Ito for a suggestion of what oscillator is appropriate in a charge pump, but rather would be guided by prior art that is directed expressly to charge pumps.

There is no motivation to combine any particular teaching of Ito with art that is specific to charge pumps. Tasdighi, which explicitly disavows unconventional charge pump clocks, is not only devoid of such motivation, but teaches away from non-conventional oscillators. Ito would not obviously be combined to remedy the failures of Tasdighi, and thus cannot support an assertion of *prima facie* obviousness for any of the Applicants' claims that are limited to charge pumps.

On page 31 of the current Office Action, the Examiner refers to a "Notani" reference in "the accompanying PTO-892." No such reference is seen in any communication with the Examiner.

Rejections under 35 USC § 112

On page 7 of the current Office Action, the Examiner rejects Claims 10, 12-15, 19-21, 27-28, 34-36, 39, 41-43, 45-48, 50-53, 56, 60, 62-63 and 65-66 as indefinite. Remarks regarding each specific grounds for rejection are set forth below.

In regard to Claim 10, it is respectfully submitted that "coupling substantial charge into the transfer capacitor via the charge pump clock output" is clear, as it means what it literally states: that the charge is coupled via the clock output. A less equivocal statement cannot be accurately made, because there is always a finite amount of charge transferred via parasitic capacitances. In several embodiments (see, *e.g.*, Claim 12(b)), substantial charge transfer via the charge pump clock output is explicitly precluded, in order to clearly distinguish that family of charge pumps wherein the "clock" is also the primary source of current to the transfer capacitor. In other embodiments, such as Claim 1, such transfer of current via the charge pump clock output is not precluded, and Claim 10 serves to explicitly cover charge pumps of that family. Thus, due to the existence of a family of charge pump circuits that conduct substantial current to the transfer capacitor via the "clock," terminology such as the Examiner objects to is needed to identify whether or not such conduction is covered by the claim in question, *i.e.*, whether such family is covered.

Amendments are proposed above for Claims 13-15, 42, 46-48, 60 and 62 in accordance with the Examiner's rejections. Remarks regarding each of the Examiner's grounds for rejection are set forth below.

In regard to Claims 12, 20 and 28, it is respectfully submitted that limitation to a waveform that is "substantially sine-like" clearly distinguishes numerous charge pump designs from the claimed invention, and indeed may well distinguish the vast majority of such designs. As such, this clock output waveform limitation is very useful and effective to particularly point out and distinctly claim inventive subject matter. Many (indeed, most) charge pumps utilize a substantially rectangular wave clock drive to control their switches. The "significantly sine-like shape" of the clock waveform of some of the Applicants' embodiments cannot be defined as precisely a sine wave, because it generally is not. Moreover, because it is not limited to a single waveform, a figure would not particularly enhance precision. Nonetheless, requiring the clock waveform to be "substantially sine-like" clearly conveys to the skilled person at least that distinctly un-sine-like waveforms (*e.g.*, pulse or rectangular waveforms, etc.) are not covered. Because the skilled person would clearly distinguish "substantially sine-like" from "substantially rectangular," "substantially sawtooth," and numerous other possible waveforms, this limitation serves quite effectively to distinguish the claimed subject matter claimed from probably the great majority of charge pumps. Thereby, the limitation greatly reduces uncertainty as to whether a particular embodiment is covered by a claim containing this limitation. Because such reduction of uncertainty is the goal of claim clarity, it is respectfully submitted that this limitation, which is phrased as precisely as possible under the circumstances, satisfies the requirements of 35 USC 112, second paragraph.

Ring oscillators having more than three stages will generally tend to have a substantially rectangular output waveform. However, the output waveform rectangularity can be enhanced, for example by increasing drive current capacity and reducing capacitive loading on the output stage, such that even a three-stage ring oscillator has a substantially rectangular waveform. Claims 12, 20 and 28 would not cover such designs. Conversely, even a perfect square wave can be made substantially sine-like by appropriate signal conditioning. Restricting the output waveform, even imprecisely, provides significant clarification of claim scope precisely because the output waveform is a very distinct issue from the nature of the source oscillator.

Claim 12 refers only to current sourced or sunk with respect to the output of the charge pump clock output (see clause 'c'). Claim 14, however, refers to a plurality of drivers, each having a driver output. Thus, for example, a three-stage ring oscillator will typically have two driver circuits (each source/sink current limited) in addition to the "charge pump clock output" driver of Claim 12.

Regarding Claim 19, it is agreed that the use of "a second charge pump stage" implies a first stage in the chain of dependency. Given that only one charge pump stage has been described in Claim 18, and that furthermore the essential features of such second stage are all suitably designated as "second," it is respectfully submitted that there is no ambiguity here whatsoever. The alternative of having "first" elements identified throughout Claim 18 creates an unsatisfied expectation of additional stages in Claim 18, which are

not required; and the further alternative of identifying, in Claim 19, each stage element in Claim 18 as having been a "first" such, and now introducing a second such, would be appallingly verbose, yet would not truly enhance clarity.

Also regarding Claim 19, "all" such devices would refer to however many devices are appropriately implicated by the claim construction, whether that be one or one hundred, and there is no loss of precision. "All" does not imply two or more, and indeed could theoretically refer to an empty set without ambiguity. For example, if one is granted half of "all of John's gambling winnings," one might not be any richer if John is unlucky. This paragraph also applies to Claim 27.

Regarding Claim 34, TC (transfer capacitor) was defined first; then that acronym was used to define a further acronym: " ... a TC-coupling switch ("TCCS") circuit ... ." Thus, TCCS simply means transfer capacitor coupling switch, while TC (without the CS) continues to mean "transfer capacitor." When the same phrase (especially one that describes a particular conceptual entity of frequent application) must be repeated numerous times in a series of claims, abbreviation by means of a properly defined acronym is appropriate.

Regarding Claim 36: the Examiner seemed to suggest that "first" elements of Claim 18 should have been explicitly 27, though in that case the implication was sufficient. Claim 36 recites in part (underlining, italics and brackets added to distinguish word groups): " ... [a first clock generator *driver circuit*] is [*a driver circuit* functionally incorporated in a first clock generator circuit configured to generate the first charge pump clock output] ... ." Ring oscillator clock generator circuits, for example, typically include a number of driver circuits.

Thus, with regard now to Claim 39, "all" first clock generator driver circuits means all the *driver circuits* in the first clock generator (circuit). "A particular" first clock generator *driver circuit* refers to a particular one of such driver circuits. This is a similar issue as is described above with respect to Claims 12 and 14.

In regard to Claim 41, "a passive TCCS circuit" contrasts, for example, with "an active TCCS circuit." (TCCS is defined in Claim 34, as noted above: transfer capacitor coupling switch.) A diode is a common example of a passive TCCS. This makes clear that all TCCS circuits need not be actively controlled. Interestingly, "a discharging TCCS circuit under control of a first charge pump clock output," as recited in Claim 28(c), may be a passive circuit, such as a diode, at least for that family of charge pump circuits in which substantial transfer capacitor currents flow via the charge pump clock output. In Applicants' FIGURE 7, for example, both charging TCCS 704 and discharging TCCS 706 are configured as passive diodes.

In regard to Claim 42, clause c) recites: "coupling a first terminal of the TC to a common reference connection of the output supply via a discharge common TCCS." This is definitional; the "discharge

common" TCCS is thus distinguished from the "discharge output" TCCS, which is defined in clause d). Each is a "discharge TCCS," but one couples the TC to common, and the other couples the TC to the output.

When TCCS is used alone it generally refers to a single device. Of course, one can create a circuit comprising numerous devices that perform the function of a TCCS. "TCCS" and "TCCS circuit" may be substantially synonymous, yet a TCCS *circuit* is likely to include a TCCS (device) as a primary switching device, a situation that would be very confusing if one cannot distinguish "TCCS" from "TCCS circuit." Thus, at least sometimes they are different.

In regard to Claim 45, the capacitor is coupled to that particular driver output node that serves as the first charge pump clock generating circuit driver output node. Claim 45 recites in part (underlining added): "coupling a capacitor to the driver output node of the first charge pump clock generating circuit to limit voltage transition rates of the driver output node." It seems clear enough that "the" "driver output node" is the same one which is identified more completely, only a few words earlier, as "the driver output node of the first charge pump clock generating circuit." The operative words of Claim 45 (those that are not underlined above, in fact) are in danger of being completely obscured by the objects upon which they operate.

Claim 43 d) recites in part (underlining added): "wherein the inverting driver output node of one of the not more than three inverting driver stages of the first charge pump clock generator circuit is the first charge pump clock output." Thus, there is more than one inverting driver output node, but one of them functions as, or is, "the first charge pump clock output." This can be significant, because (as noted above with respect to Claim 10) of the family of charge pumps (*e.g.*, FIGURE 7) wherein substantial TC current is conveyed via the clock output. One might "redefine" the clock to include a device for charging the TC and one for discharging the TC. Thus, for example in FIGURE 6, the clock might be defined to include not only 524, but also 618, 626 and 602, and possibly 622, 630 and 608. The definition provided in Claim 43 d) precludes such redefinition, which otherwise would permit the charge pump to be looked at as belonging to either a "nonconducting clock" family or to a "conducting clock" family of charge pumps.

In regard to Claim 50, it is noted above with respect to Claim 42 that there may be one discharge TCCS from TC to common, and another discharge TCCS from TC to output. The point in Claim 50 is that a plurality of discharge TCCSs are under control of the single phase charge pump clock output; Claim 49 only required one. This is not misleading: the output supply in FIGURE 6, of necessity, has *two* terminals, one of which is a common (often called ground), and the other of which is the terminal that is the output supply *with respect to* that other terminal. This is confusing only by the nature of most charge pumps, in which the common voltage is connected to a terminal of the output supply, but is also connected to a terminal of the input supply. Indeed, that's why it's called common. These same remarks, of course, also apply to the charging TCCSs.

In regard to Claim 56, Claim 49 only requires one active charge TCCS and one active discharge TCCS, though there are often two charge TCCSs and two discharge TCCSs. As set forth in the remarks above, TCCSs can be passive (*e.g.*, FIGURE 7), and Claim 56 would become nonsensical if such passive TCCSs were not excluded from the clock coupling requirements. Note that the Examiner's query regarding "each actively controllable TC" is misleading, because it is the TC coupling switch that may be actively controllable (or not), not the TC (transfer capacitor) itself. Indeed, it might be better to employ "TCCS" throughout the claims, but in these claims it has been drafted more expansively as "TC coupling switch," but no error of antecedent basis, nor any inconsistency within a chain of dependency, is seen.

In regard to Claims 60 *et seq.*, it is a fact that there must be an output supply, which is the supply produced by the charge pump, and yet there is also an output to every driver within the clock generating circuit, as well as an output from the clock circuit as a whole. A circuit is nothing more than a potentially huge nest of subcircuits, and each circuit and subcircuit probably has its own input and output. The Examiner's queries in respect of Claim 60 reflect a misunderstanding that is addressed above with respect to Claims 42 and 50, namely that there are often two charging TCCSs (one to source supply and one to source common), and two discharging TCCSs (one to output supply and one to output common), and that both the source and output supplies have two nodes, one of which is generally referred to as "common." This is clearly shown in FIGURE 6. The parenthetical terminology follows that employed in Claim 42. The discharging TCCSs are 608 (discharge common TCCS) and 610 (discharge output TCCS), while the charging TCCSs are 604 (charge common TCCS) and 602 (charge input TCCS).

Amendments to Claims 13, 42, 46-48, 60 and 62 as proposed above will remedy the relevant antecedent basis errors noted by the Examiner. "Switch" and "switch circuit," as discussed previously, may be synonymous, but should in any event be employed consistently in any one dependency string. In Claim 48, the modifying term "clock" had been overlooked, as was "supply" in Claim 60.

Claim Objections

The Examiner sets forth numerous claim objections beginning on page 4 of the current Office Action. Amendments to Claims 7, 43, 51-52 and 64 are proposed above in view of these objections. The remarks below address each grounds for objection set forth.

With regard to Claims 12-17, it is respectfully submitted that ordinary claim construction rules treat "an active driver" as meaning "at least one active driver," such that the more verbose form is not necessarily better. In regard to Claims 36-37 and 39, the source and sink currents of Claims 36 and 37 regard particular drivers, whereas claim 39 refers to all drivers; "the" is therefore inappropriate for Claim 39.

With regard to Claim 1, "voltage" is a constantly changing value that therefore should not, in this claim at least, be referred to as "the" voltage. "The voltage" should better be reserved for particular values of voltage that have antecedent basis, though it is acknowledged that informal usage ignores this subtlety. The proposed amendment, however, will add "the" in Claim 7.

With regard to Claim 12, the Examiner appears to misconstrue the terms "source" and "sink," which are used here as verbs rather than nouns, such that "the" is not appropriate. In regard to Claim 17, source and sink are adjectives, but "the" is still not appropriate because it would suggest a comparison between the source currents, when the intended comparison is from source currents to sink currents.

In regard to Claim 18, the word choice of "all" is respectfully submitted to be at least as clear as "each." Claim 24 recites in part: "one of the control nodes corresponding to a source switching device or to an output switching device." The subject is "one of the control nodes;" the rest is simply part of the proper antecedent description for the subject, and is not in itself a subject; thus, the Examiner's suggestion is respectfully declined.

With regard to Claim 26, it is respectfully submitted that the present language is less verbose and no less clear than that proposed by the Examiner. It is agreed that the broad construction the Examiner proposes is possible, so that prior art teaching such a construction would be relevant.

With regard to Claims 28-29, 31 and 42, a definition of the acronym TCCS is completed with only the following words: --TC-coupling switch ("TCCS")--. As clearly stated, a TCCS circuit "is a switching circuit of the charge pump configured to couple the TC to a supply under control of a charge pump clock." Once TCCS circuits are understood, differing types of such circuits may be introduced, including "charging" TCCS circuits and "discharging" TCCS circuits, depending upon the function they perform with respect to the TC (transfer capacitor). Accordingly, these claims are correct as pending.

In regard to Claim 39, source and/or sink currents for all first clock generator driver circuits have not been previously defined, so the Examiner's proposal lacks antecedent basis. Claim 43 is proposed for amendment to delete the redundant "d)." Claim 55 is believed at least as correct as the alternative proposed by the Examiner, but Claims 51-52 and 64 are proposed for amendment in accordance with the Examiner's suggestion.

Thus, all appropriate corrections are incorporated into the proposed amendment set forth above.

Conclusion

In view of the foregoing remarks and the proposed amendments, it is respectfully submitted that each claim will be fully in condition for immediate allowance if the Examiner enters the proposed amendments. In

the absence of new prior art that renders obvious at least some claims of the subject application, it is respectfully submitted that the present application should be immediately allowed rather than continued in order to correct a few minor clarity issues. As such, the Examiner is respectfully requested to enter the proposed amendments, to withdraw each of his grounds for objection and rejection, and in due course to issue a Notice of Allowance in respect of all pending claims.

Should the Examiner find any issue that can benefit from further clarification, he is respectfully urged to contact the undersigned by telephone. The undersigned will be pleased to do everything possible to reduce the time and effort required to complete a thorough examination of the subject application.

The Commissioner is authorized to construe this paper as including a petition to extend the period for response by the number of months necessary to make this paper timely filed. Fees or deficiencies required to cause the response to be complete and timely filed may be charged, and any overpayments should be credited, to our Deposit Account No. **50-0490**.

Respectfully submitted,

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